THE PIKERMI AND SIWALIK FAUNAS PLIOCENE, NOT MIOCENE

THE best zoologists are in the habit of calling the mammalian fauna of Pikermi, in Greece, *miocene*. As instances, I may quote Mr. Wallace in the "Geographical Distribution of Animals," p. 118, where it is expressly stated that the mammalian remains in question are "from the upper miocene deposits of Pikermi," and Prof. Flower, in his paper "On some Cranial and Dental Characters of the Existing Species of Rhinoceros," P.Z.S., 1876, in which he mentions, p. 457, "the miocene *R. pachygnathus*, Wagner, from Pikermi."

I had occasion, a few days since, to consult Gaudry's "Animaux Fossiles et Geologie de l'Attique," in connection with the Siwalik fauna—also persistently, but, I believe, wrongly classed as miocene by European geologists and naturalists—and to my surprise I found it shown by the clearest evidence, that this Pikermi fauna occurs in pliocene beds, the age being proved by the occurrence of marine shells at the base of the bone-beds, and by the circumstance that the strata containing both bones and miocene shells rest unconformably on others with miocene plants. The latter fact is less important than the former, the value of plant remains for the determination of geological age being a disputed point, but no geologist hesitates to accept the indications afforded by marine annuals in preference to all others, and the tertiary marine faunæ of the Mediterranean area are particularly well known.

M. Gaudry proposes a hypothesis, *op. c.*, p. 431, to account for the presence of so many miocene forms in pliocene beds. It must not be forgotten that several Pikermi species are identical with forms found in undoubted miocene strata in Central and Western Europe. The theory proposed is briefly that the Pikermi mammals were driven into the hills by the breaking up of the miocene land, and starved to death, when their bones were washed down into the bed with pliocene mollusca. As there must have been, I think, a long interval of time between the deposition of the disturbed miocene beds and the formation of the unconformable pliocene strata, I think the following suggestion is preferable, as it avoids the idea of any sudden change. There is abundant evidence that the refrigeration of the earth's surface, culminating in the glacial epoch, commenced in pliocene times, and this may have led to a southern migration of the mammalia, so that animals which, in the earlier epoch, inhabited Central Europe, at a later period still survived in Grece, although they had been replaced by pliocene forms further north. It has already been shown by various writers that there is a connection between certain miocene faunas in Central Europe and the living mammalia of Africa on the one hand, and of the Malay countries on the other, and I think it not improbable that the remains found in pliocene beds in Greece, and at the base of the Himalayas, owe their miocene affinities to the same facts of migration to which similar affinities may be attributed in the living forms.

The evidence of the pliocene age of the Siwalik is simple. In Sind strata containing miocene marine fossils pass up into beds with a mammalian fauna, including some of the older Siwalik forms, such as *Mastodon, Chalicotherium, Dorcatherium*, &c., together with *Dinotherium, Hyopotamus, Hyotherium, Anthracotherium*, &c., which have never been found in the true Siwaliks. These Sind beds are apparently equivalent to the lower Siwaliks, which are unfossiliferous in the typical area. In the middle and upper Siwaliks, instead of the old forms just named, *Elephas, Loxodon*, cervine and bovine ruminants in abundance, and other recent types are found. Now, as the Sind beds cannot be older than upper miocene, the typical Siwaliks must be pliocene. The mammal *Bos* (*Bubalus*) *palæindicus*, found in the upper Siwaliks, occurs also in the Nerbudda alluvium, where it is associated with palæolithic implements. It is not credible that a mammalian species could have lived from miocene to post tertiary times.

The question of the true age of these later tertiary mammalian fauna is of such vast importance in the attempts now being made by many naturalists to work out the line of descent of living animals that I trust I may be pardoned for calling attention to the preceding facts.

W. T. BLANFORD

OUR ASTRONOMICAL COLUMN

SCHMIDT'S CHARTE DER GEBIRGE DES MONDES.—In the Introduction to the *Erläuterungsband*, accompanying Prof. Schmidt's lunar charts, he has given an interesting account of the progress of his great work, of the difficulties he encountered, and the assistance afforded him in a variety of ways, until the honourable and flattering conclusion. It was in the autumn of 1839, at his native place, Eutin in Holstein, that his attention, at first given to botany and zoology, was directed to the moon, by the circumstance of a copy of Schröter's work having come into his hands through a sale by auction. The engravings of the numerous craters and mountain-shadows made so strong and lasting an impression upon his mind that he appears to have resolved to make the study of the surface of our satellite the principal aim of his life. At fourteen years of age the possession of a small draw-telescope, constructed by his father, enabled him to commence his observations of the lunar features, and his first sketch was one of the well-known streaks of Tycho, made with this instrument, which was supported against a street lamp-post! A stand being subsequently provided, he began to draw whole phases, in which Mayer's charts were found of service. Thus he observed in 1840, his school studies, as he tells us, suffering thereby not a little. As so often happens in similar cases, young Schmidt's peculiar bent attracted the attention of one who had the disposition and the means to aid him, and State-Councillor Hellwag, a highly-educated man, with advanced knowledge of astronomy, provided him with a very perfect telescope by Dollond, and with it he observed at Hellwag's house. In July, 1841, he saw the moon for the first time in a large telescope, Petersen, assistant to Schumacher at Altona, having shown him the crater Gassendi and Bullialdus. He then learned first, as he says, the richness of the lunar formations, the more that he became acquainted at this time with the large chart of Mädler. In 1842 Schmidt went to Hamburg, and obtained access to the observatory under Rümker's charge; here, through the good-will of the director, he made use of various telescopes in furtherance of his lunar work during the years 1842-45. In June, 1842, he was also assisted by Herr Bartels, of Hohenfelde, near Hamburg, who allowed him the use of his telescope, and it was at this time that he made the earliest drawings which proved available in the construction of his great chart. In 1845 he went to Bilk, near Dusseldorf, the site of Benzenberg's observatory, but his progress was slow here, the principal instruments originally in the building not being then serviceable. During his residence at Bonn in connection with the observatory presided over by Argelander, this continued to some extent, the regular work of the establishment claiming attention; nevertheless in the period 1845-1853 he obtained sketches which proved of value, with written descriptions of many of the features of the moon's surface. On several occasions during this interval, by the encouragement of Profs. Galle and Bruhns, he had opportunities of making drawings with the aid of the Berlin 9-inch refractor. From 1853 to 1858, Schmidt had charge of the observatory of Herr v. Unkrechtsberg, an ecclesiastic at Olmütz, and here he undertook micrometrical measures for determining the heights of the lunar moun-

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tains, &c. In March, 1855, visiting Rome, he made sketches with the large refractor of the Observatory of the Collegio Romano, and in the following month delineated many of the lunar landscapes with the telescopes at the Observatory of Naples. In December, 1858, he entered upon his present position as director of the Observatory of Athens, but from the state of the institution and the instruments, observations were not practicable for nearly a twelvemonth, so that it was only in November, 1859, that he was able to use, for his work on the moon, the 6-feet Plössl refractor, with which so much of the remainder of his long-continued labours has been completed.

In January, 1865, he formed the project of preparing a lunar chart, but his experience upon it for a considerable time was not satisfactory, for reasons which he details. In April, 1867, his final resolve was taken, and setting aside the results of his previous attempts at the construction of maps, he chose for his scale a 6-feet diameter, and, after the example of Lohrmann, arranged to subdivide his chart into twenty-five sections, as it has appeared. The work proceeded steadily until, in 1873 and 1874, those parts of it not strictly topographical and the colouring were completed.

In December, 1874, Prof. Schmidt proceeded to Berlin with his chart, for the purpose of exhibiting it to the authorities, astronomical and otherwise, in that capital. The interest which it excited here led to a fortunate combination of circumstances, through which the editing of the work was secured under the protection of the State, and the Crown Prince was instrumental in procuring the publication of the chart. At the suggestion of the Prince, the twenty-five sections were photographed in the department of the General Staff, and in April, 1875, Prof. Schmidt received from Field-Marshal Count von Moltke proofs of the same, which enabled him to bring the descriptive portion of his work to a close, while the original charts were retained at Berlin.

Such is a brief outline of the history of an astronomical undertaking that has occupied a lifetime. We must refer the reader to the explanatory volume for further interesting particulars of its progress and vicissitudes while under construction, at the many stations where its talented and indefatigable author has been located—from Altona to Naples.

NOTES

MORMONISM, whatever we may think of it as an institution, is so far in harmony with the times as to appreciate the value of scientific investigation; and its leaders seem to be heartily desirous to do what they can to further its interests. A recent number of the *Deseret News*, the leading organ of the Church party in Salt Lake City and Utah Territory, contains an account of the reception by President John Taylor, the successor to Brigham Young, of Dr. Thorpe, of the Yorkshire College, Leeds. Dr. Thorpe, accompanied by Dr. Schuster and Mr. Haskins, of St. John's College, Cambridge, is making a series of magnetic observations across the American Continent along the line of the Union Pacific Railroad, and Salt Lake City was selected as one of the stations. The president evinced considerable interest in the work, and showed a great desire to be informed respecting its character and objects. He offered to assign any spot within the city which might be deemed most suitable for the observations to the party, placed the transit instrument in the Tabernacle yard at their service, and suggested the laying of a special wire from his private telegraph office to the observatory for the purpose of exchanging time-signals with Prof. Safford, who is determining longitudes at Lieut. Wheeler's base station at Ogden. With such facilities the magnetic elements of Salt Lake City ought to be accurately known.

PROF. STRUVE, director of the Pulkova Observatory, is leaving Russia for a visit to Western Europe, for the purpose of giving directions for the construction of a new great refractor for the Pulkova Observatory. The old refractor, which some time ago was one of the best in the world, is now behind those of Washington, Chicago, and Gateshead (Mr. Newall's Observatory), and the Pulkova Observatory, according to the will of its founder, the Emperor Nicholas, should be maintained superior to all other observatories in that direction.

WE regret to announce the death, on August 15, at Kiel, of Prof. Emil von Asten, of the Pulkova Observatory, at the early age of thirty-six years. A pupil of Argelander, he is known by several remarkable researches,—as the investigation into the orbits of Uranus, and especially by his researches into the motion of Encke's comets with regard to the existence of a resisting medium. After ten years' study of the subject, he published a series of "Memoirs," in which he proved the existence of a medium, and showed why its influence could not be observed on other comets, as, for instance, that of Faye. His "Memoirs" have given rise, as is known, to one of those remarkable suggestions of Prof. Mendéleeff, as to the physical properties of this medium. Prof. Asten was, besides, one of the most valuable calculators of our time, and many of the Pulkova observations were reduced and calculated by him, or under his direction. His work on the sum of temperature, necessary for the development of several plants of the flora of St. Petersburg, was done during his leisure hours, as well as his discussions on the philosophy of Schopenhauer and Hartmann, of whom Prof. Asten was an admirer.

M. FIZEAU, the present president of the Paris Academy of Sciences, has been appointed to the Bureau des Longitudes, to fill the place vacated by the death of M. Leverrier.

WE have received the programme of a singular propaganda which seems to have been suggested by the recent opening up of the East to Western influences, and to which we cannot but wish all success. The circular is issued by M. C. Constant, of Smyrna, a member of the Asiatic Society of Paris, and his scheme is to form a society for the publication in Armenian of cheap popular scientific works, as one of the best means of enlightening and developing the people of the East, and of forming a bond of sympathy and union between those of all creeds. It is wished to implant in the East the great principles of the Experimental School, which form the greatness of the West. Special attention will be given to anthropology and the social sciences, which constitute the great problems of the age. The Eastern peoples are at a turning-point in their career, M. Constant says, and they ought to be prepared for the only definitive conquest to which they will submit sooner or later, "the conquest of science, that first European power." The proposed "Eastern Scientific Library" will be begun by the publication of an introductory volume treating of the positive method and its history; it will be a summary exposition of the intellectual evolution of humanity, from pre-historic times to the present. M. Constant makes appeal to the scientific societies of Europe for aid in this enterprise, and communications should be addressed to him as above.

THE Iron and Steel Institute holds its summer meeting at Paris this year, on September 16, 17, and 18, at the rooms of the Société d'Encouragement, 44, rue de Rennes. Besides the Introductory Address by the President, Dr. C. W. Siemens, papers will be read by Prof. Jordan, Paris, On the Mineral Resources of France; by Prof. Richard Akerman, Stockholm, On Some Studies Relative to the Present State of the Iron and Steel Manufacture, made at the Paris Exhibition; by Mons Euverte, Terre Noire, On Homogeneous Steel; by Danie Adamson, Manchester, On the Mechanical and other Properties of Iron and Mild Steel; by Mons. Marché, Paris, on Certain

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